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See page 3 cover for additional material.

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The High School Instructor

VOL. II SASKATOON, SASK., MARCH, 1936 NO. 7

EDITORIAL

A PLAN FOR REORGANIZATION OF SCHOOL ADMINISTRATION

THERE has been widespread interest during recent months in the proposal to reorganize our schools into more centralized units for purposes of administration and finance. What is now taking place in Canada, and in Saskatchewan and Alberta in particular, is but a belated struggle which has been the experience of almost every country in the past. European nations early centralized their system of public schools, and in the last thirty-five years every autonomous country in the British Empire, with the single exception of Canada, has taken away the power of the small local district and has substituted the authority of a more sizeable unit. England and Wales, after many years experience with the small district system, swept the district boards away in 1902. Now 317 local educational authorities administer elementary and secondary education for thirty-five million people, and the cost of education is equitably spread over the entire population. Scotland waited until 1918 to reorganize, but now thirty boards control the schools of Scotland. It is the same story in Ireland; in New Zealand, where there are nine boards; in Australia, where each province has a centralized system; in South Africa, where there is a national system. Canada has the distinct advantage of being able to adopt a system based on the experience of many countries.

The general features of the plan most widely mooted in Saskatchewan are as follows. The number of local districts would be reduced from about five thousand to about sixty-five or seventy. This would be accomplished by combining the districts of about four municipalities under the direction of one board. The plan does not contemplate the consolidation of schools and the conveyance of pupils. Any consolidation of schools which would take place would depend entirely on the wishes of the ratepayers in any given unit. The districts as now existing would remain as at present until it was the will of the people to change them. The board of the larger unit as suggested would consist of five members, four elected and one co-opted. It would have the services and advice of a superintendent who would be charged with the general direction of all the schools in the unit. There would be one tax-rate for the whole area to provide for a prescribed minimum of educational services. Any services above the prescribed minimum, except those determined by the board to have general application, would be a charge upon the district desiring the extra services, and would be paid for by an additional levy on the district concerned. The government would then be expected to equalize the cost as between poor and more richly endowed areas by a system of equalization grants.

Injustices of the Present System

Some of the advantages claimed for the proposed reorganization are: better service to rural communities, more equality of educational opportunity in the increased possibility of establishing rural high schools and in establishing diversified types of education, increased supervision, better placement and security for the teacher, greater economy of operation, equalization of costs, greater opportunity to establish health services. Perhaps the strongest arguments against the present system in a democratic country are the injustices it entails. The tax burden for the support of schools is most inequitable. There are almost as many different rates as there are schools within a municipality, and these range all the way from three to thirty mills. There is no democratic justice in this state of affairs, and the proponents of the larger unit feel that once the general public are fully cognizant of this state of affairs, their sense of democratic justice will demand a change. Since education is a matter of state interest rather than local interest, there is great injustice in present arrangements.

Another, and perhaps the most serious, form of injustice is the inequality of educational opportunity. The great problem is that of providing schooling above the elementary grades. Our present small districts cannot make a pretense at providing it. At present there is a general tendency to force the teaching of high school subjects, even to Grades XI and XII, on the teacher of an un-

graded school. This can be done only at the expense of the pupils in the lower grades who should be the primary consideration in such a school. The larger unit would permit the board to take a wide view of its secondary school needs. It would be possible to draw off the pupils above Grade VIII and place them in one or two schools provided for the purpose. There would be transportation only for the few coming from a distance, or it might be feasible to establish dormitories. In any case the problem would be one of older pupils, and so more easily dealt with than if little ones were involved. Whatever may be the problems involved, it is impossible to argue the justice of a system which allows for splendid educational advantages for the boys and girls in one section of the province and denies it to those in another.

Efficiency of Administration

An increased efficiency of the schools under larger units is promised by the fact that more capable men and women would be called into service as trustees, or, perhaps more exactly, the services of good men and women now called to the work would be made available to a large number of schools. In the present small districts it is often impossible to get three trustees who understand educational problems or who are really interested in providing efficient instruction. There would be much more likelihood of getting five good directors if the choice were spread over a wide area. At present the services of an able man or woman are confined to his locality; the larger unit would make them available to many schools.

The trustees would be more interested in the schools for there would be real work to do. Busy people take the keenest interest in what they have in hand. Since there would be business to do in the operation of from sixty-five to eighty classrooms, the board would meet regularly. The superintendent would be required to attend all board meetings and so the boards would always have the benefit of expert knowledge. Such an arrangement could not fail to bear wonderfully good fruit in the schools of the unit.

Finally the proponents claim that the new system could be instituted without additional cost in normal times over the present system. They claim that the cost of increased supervision would be counterbalanced by savings in other directions. The plan, to say the least, is sufficiently commendable to warrant study under government authority. The demand for change is widespread throughout the provinces of Canada and the American states where the small district system prevails. Ohio has set aside this year $121,000 to study the problem, and a total of about a million dollars is being spent in the United States to study ways and means of reforming the school system. We should do no less.

Topics of Interest

ADOLF HITLER

Hitler was born in 1889 in a small town in Austria near the German border. His father was an Austrian customs official. His mother was Bohemian. His sympathies from his earliest years were with Germany, not Austria. At the age of sixteen he had lost both his father and mother. He went to Vienna, the Austrian capital, to look for employment. There he rose from the wage-earning ranks to become a draughtsman and painter in water-colors.

He spent much time in reading; he attended trade-union and political meetings. He began to see Jewish power everywhere in Vienna, and hence became rabidly anti-Jew.

In 1912 Hitler moved to Munich. On the outbreak of the war he joined a German regiment. He was on active service during the whole of the war and was gassed once and wounded once. As far as war records show he never distinguished himself. He was promoted only to the rank of corporal.

When the war ended, he resolved to be a politician. From the very beginning of his political career he was an ultra-German Nationalist;

he was ferociously anti-Jewish and anti-Marxist. He was passionately hostile to the new German Republic that had been set up after the Kaiser had left the country. In 1919 he was in Munich serving in a regiment whose job it was to keep an eye on the communists in Bavaria. While there he was appointed as lecturer in political education. While acting in this capacity it became the duty of corporal Hitler to gather information concerning the "German Workers' Party", one of many similar organizations that had sprung up in Germany. This party consisted of six members, and Hitler became the seventh.

From the very beginning of his connection with this party he imbued his colleagues and disciples with the idea that "fanaticism moves mountains". He admitted no doubts; he spoke with no qualifications. He professed to know all that he wanted and how to get it. At first very few were interested in what he had to say. His meetings were held outdoors. In 1920 he held his first big indoor meeting which was attended by some 2,000 persons. From then on the movement of which he was the leader spread rapidly. His gift of oratory attracted many to his meetings. The themes of his speeches were the "Lie About Germany's War Guilt," the "Jewish Treachery which Robbed Germany of War Victory," the "Necessity of Tearing up the Peace Treaties." His opponents at first ignored him, regarding him as a "harmless lunatic with a gift for oratory."

His Bid for Power

Germany's economic distress greatly aided Hitler's movement. In 1923 when the famous "Putsch" took place, the French were in the Ruhr, the German mark was worthless, Bavaria was in a ferment. General Ludendorff, obsessed with the idea that if he were in command of Germany he could drive the French out of the Ruhr and at least restore a vestige of Germany's former greatness, united with Hitler to overthrow the existing government. In November, 1923, both Ludendorff and Hitler with sparse followers, marched on Berlin. The government forces fired on the marchers. The "Putsch" failed. Hitler escaped unhurt. Later he was arrested and tried for treason, but as his attempt to overthrow the government was generally regarded as misguided patriotism he was given but a light sentence.

Movement Suffers Decline

On his release from prison Hitler found Germany embarking on an era of prosperity. Loans from the United States had helped to stabilize the financial affairs of the country. Hitler now found few willing to listen to him. Annoyed, he began to denounce the artificial prosperity brought about by foreign loans—a prosperity which he felt diverted Germany's attention from her national humiliation as well as from the attractions of his own program. Thus it was that in 1928, after almost ten years of propaganda, his party called "The Nazis" could command only twelve seats in the Reichstag.

His Rise to Power

In 1929 there occurred the Wall Street smash in the United States. American gold ceased to flow into Germany, with the result that German prosperity collapsed. In the elections of 1930, after a year of the depression, the Nazis won 107 seats. In the elections of July, 1932, they won 230 seats. They were now the largest party in the Reichstag, but not having a clear majority, they carried on a campaign of obstruction which in five months resulted in another election in which they suffered a slight reverse, electing only 188 members. The inability of any one group

to form a government able to command the confidence of the Reichstag brought on another election in the early part of 1933. In this election the Nazis returned 288 members and thus had a majority over all other parties combined.

Once made Chancellor, Hitler used ruthless force and he has continued to use it ever since. He sought election in 1933 with the cry, "elect me and I shall save Germany in four years." It is now three years since his election and it is very doubtful at the end of this year if it can be said that Germany has been saved.

THE JAPANESE COUP

On February 26 the world was startled and shocked by the news that the premier and several members of Japan's cabinet had been slain. Later it turned out that Premier Okada was not slain, although the Emperor had officially recognized his death by calling upon Fumio Goto to accept the premiership.

The slaying was done by army officers who said they wished to remove corrupt influences from around the throne. Prior to the Japanese elections which took place a week earlier, the Okada Government had ordered a let-up in military activities on the mainland. The fact that Okada and his party were returned with increased representation seemed to indicate that his policies found favor with the people. The election results, therefore, pointed to a further retreat from the policy of aggressive imperial expansion by military force. The coup aimed at the setting up of a military dictatorship.

The speed with which the revolt was suppressed indicates that the coup was the work of a badly organized group of military extremists. A similar revolt took place in 1932 when a group of military terrorists shot to death Premier Inukai and carried out a series of bombings at the very moment the Premier was attacked.

The election results, and the calm which prevailed in the nation while the coup was in progress, indicates a definite strengthening of liberal forces in Japan and a welcomed setback to the military group who would lead Japan into an Asiatic war.

OIL SANCTIONS AGAIN

Once again the "committee of 13" of the League of Nations has under consideration the applications to Italy of oil sanctions. On March 3 the committee decided to appeal to Italy and Ethiopia for peace and gave the two nations one week in which to reply. The committee will meet again on March 10. In the proposals for peace that were submitted to the belligerent nations it was suggested that there be negotiations for the cessation of hostilities as a preliminary to the peace negotiations. The move to press once more for peace was undertaken by the council committee with the understanding that unless definite results were achieved, the League's sanctions committee would proceed to a decision on the proposal for an oil embargo against Italy. Already the Emperor of Ethiopia has expressed his willingness to consider a settlement. Unofficially, too, Italy declared herself ready to examine any peace proposals submitted. In the event that no peace settlement can be arrived at, the "committee of 13" has prepared the text of the resolution imposing oil sanctions upon Italy. The resolution affects both the sale of oil and the transportation of tankers of oil to Italy.

Grade IX Arithmetic

Bank Discount

In our last article we saw what a promissory note was. Thus, if I lend $200 to A for 3 months, with interest at 6% per annum, it is customary for A to give me a promissory note setting out these facts. If the note was made on February 7, 1936, I would ordinarily look for payment from A on May 10. When, on May 10, A asked me how much he owed me, I would tell him that he owed me $200, together with interest at 6% per annum from February 7 to May 10. The interest would equal $\$200\times93/365\times6/100=\$3.06$. The *amount* of the note would, therefore, be $203.06. A could pay me that $203.06 directly on May 10, or he could deposit the sum in my bank to the credit of my account.

Now, I received the note on February 7. Suppose that on March 6 I found myself in need of money. To raise that money I must sell something that belongs to me. I could sell some article of furniture or some property, such as my house and lot. However, instead of selling property of this kind I would likely sell the promissory note given to me by A. I would sell the note to anyone willing to buy it. As the bank is the principal buyer of promissory notes, let us suppose that I sell A's note to the bank. Before the bank will buy the note it must be satisfied that A is one who will honor his obligations at maturity. It must be satisfied, too, that should A for some reason or other fail to meet the note on May 10, I am willing and capable of meeting it for him.

So on March 6 I sell the note to the bank. How does the bank determine how much it will pay for the note? On May 10, as we have seen above, the note is worth $203.06. On the prospect (amounting to a certainty) of receiving $203.06 on May 10, the bank will, on March 6, pay for the note a sum of money determined in the following way: Assuming that its rate for *discounting* or buying notes is 7%, it will calculate the interest on $203.06 from March 6 to May 10 at 7% per annum, and deduct the sum thus obtained from $203.06, giving the balance as the buying price of the note. Thus, the number of days from March 6 to May 6 is 65 days. The interest on $203.06 for 65 days at 7% is

$$203.06 \times \frac{65}{365} \times \frac{7}{100} = \$2.53$$

$\therefore$ the amount paid for the note is $\$203.06 - \$2.53 = \$200.53$.

The $2.53 is called the *bank discount*, the period of 65 days is called the *term of discount*, the $200.53 is called the *proceeds of the note.*

We thus say that *bank discount is the simple interest on the amount of a note from the date of discount to the date of maturity.*

Note that although the bank really only loaned $200.53 for 65 days they charged interest on $203.06. Thus the bank collects its interest in advance. Since it charges $2.53 interest for the loan of $200.53, the rate of interest that the bank is really making is

$$\frac{2.35 \times 100 \times 365}{200.53 \times 65} = 7.08\%$$

So, when the bank buys A's note from me on March 6, it will pay me $200.53 and make me sign my name on the back of the note as assurance that if A will not pay into the bank on May 10 the sum of $203.06, I will.

If the promissory note given by A did not bear interest, then the amount due on May 10 would be $200. Hence the bank discount would then be calculated on $200.

Suppose I had no note from A and I needed money, how could I raise it? I could go to A and ask him if he would back my note for $200. If he consented, I would give him a promissory note agreeing to pay him $200 in, say, three months, with interest at 6%. I would get A to endorse the note, that is, write his name across the back of it. I would then bring it to the bank, and assuming that A's credit was good, the bank would discount the note for me. If the note was made on February 7, it would be legally due 3 months and 3 days after February 7, namely, May 10. The amount of the note on May 10 would be $203.06. If I took the note to the bank on February 7 and the bank discounted it at 7%, the bank discount would be

$$\$203.06 \times \frac{93}{365} \times \frac{7}{100} = \$3.62$$

∴ the proceeds of the note, or what the bank would pay me, would be $203.06 − $3.62 = $199.44.

If I failed to meet the note on May 10, then A would be called upon to make good my promise.

Now do question 1-19, page 182 text.

Compound Interest

If I loan $100 for 1 year at 5%, the interest that will accrue at the end of the year is $5. If I add this interest to the $100 and re-loan the total for another year, the interest that will accrue will be $5/100 \times \$105 = \$5.25$. The interest for the two years is $10.25. We say that $10.25 is the compound interest on $100 loaned for 2 years at 5% and compounded at the end of every year. By compounding the interest, therefore, we mean the adding of the interest to the principal at the end of each interest period, the principal for each period after the first being the principal for the preceding period together with the interest that accrued for that period. Thus, in the above example, the interest for the 3rd year would be $5/100 \times \$110.25 = \$5.51$. Hence the compound interest for three years is $15.76.

We could arrive at the same result by noting that the amount of the loan at the end of the 1st year is 105% of $100, namely $105/100 \times 100$; and at the end of the 2nd year it is 105% of what it was at the end of the 1st year, namely, $105/100 \times 105/100 \times 100$; and at the end of the 3rd year it is 105% of what it was at the end of the 2nd year, namely, $105/100 \times 105/100 \times 105/100 \times 100$. Now $105/100 \times 105/100 \times 105/100 \times 100 = 1.05 \times 1.05 \times 1.05 \times 100 = (1.05)^3 \times 100 = \$1.15763 \times 100 = \$115.76$. If we subtract $100 from $115.76 we get $15.76 as compound interest for the three years.

If the amount of the loan at the outset were $1 instead of $100, it is clear, by the same reasoning, that the amount at the end of three years, compounding yearly, would be $(1.05)^3 \times 1$ or $(1.05)^3$. We thus see that $(1.05)^3$ is the amount of $1 at interest at 5% for three years, compounded yearly. The amount, therefore, of $2 for the same time

and rate would be twice as much, namely $(1.05)^3 \times 2$, and of \$5.60 would be $(1.05)^3 \times 5.60$. If, therefore, we know what the amount of \$1 is for any time at any rate, we can find the amount of *any* sum for the same time and the same rate. Thus the amount of \$1 for 5 years at 7% is $(1.07)^5$ and of \$1 for 4 years at 6¼% is $(1.0625)^4$. Hence the amount of \$97 for the same times and rates would be, respectively, $(1.07)^5 \times 97$ and $(1.0625)^4 \times 97$.

Again. if the interest is added every six months rather than every year, we say that money is compounded half-yearly. Thus, in finding the amount of \$1 for 2 years at 6% compounded half-yearly, we see that the interest at the end of one-half year is $1 \times 6/100 \times 1/2 = .03$. Therefore, the amount is \$1.03. That is, the amount at the end of the first half-year is 103% of the principal, that is, $103/100 \times 1$. As in the case when the interest was compounded yearly, the amount at the end of the 2nd half-year will be 103% of what it was at the end of the 1st half year, that is, $103/100 \times 103/100 \times 1$. Hence at the end of the 4 half-years the amount will be $103/100 \times 103/100 \times 103/100 \times 103/100 \times 1 = (1.03)^4$.

From the above discussion we see that to find the amount of \$1 for a certain time at a certain rate we take the amount of \$1 for the 1st interest period and multiply that amount by itself as many times as there are interest periods. Thus, when money is compounded half-yearly, the number of interest periods in 2 years is 4, and if the rate is 6% per annum, the rate for the half year is 3%. Hence we say that the amount of \$1 for 2 years at 6% compounded half-yearly is $(1.03)^4$, or the same as the amount of \$1 for 4 years at 3% compounded yearly.

Similarly, the amount of \$1 for 4 years at 8% compounded quarterly is $(1.02)^{16}$. That is, money is compounded 4 times a year, or 16 times altogether, and since the rate for the year is 8%, the rate for a quarter of a year is 2%. We note, too, that $(1.02)^{16}$ is the same as the amount of \$1 for 16 years at 2% compounded yearly. We thus see that when money is compounded more frequently than yearly, we can put it on the yearly basis by taking the number of interest periods as years and the rate for the interest period as the rate per annum.

To find the value of $(1.02)^{16}$ we consult the tables, page 284. Looking in the column headed 2%, and in line with 16 years, we read the number 1.37279; that is, $(1.02)^{16} = 1.37279$. This answer, as we have seen, does for the amount of \$1 for 16 years at 2%, compounded yearly, or for 8 years at 4% compounded half-yearly, or for 4 years at 8% compounded quarterly.

When the rate is 3¼% per annum, the amount of \$1 for 1 year is 1.0325, and hence for 3 years is $(1.0325)^3$; when the rate is 5¾% the amount for 4 years is $(1.0575)^4$.

What is the amount of \$1 for 7½ years at 6% compounded half-yearly? Since there are 15 interest periods, the amount is $(1.03)^{15}$.

What is the amount of \$1 for 7½ years at 6% compounded yearly? Here we must first find the amount of \$1 for the *whole* number of years. Thus, the amount of \$1 for 7 years at 6% is $(1.06)^7$. Now this amount $(1.06)^7$ is left in the bank for another half year. The amount of *any* sum for ½ year at 6% is obtained, as we have seen, by multiplying the sum by 1.03. Hence the amount of $(1.06)^7$ for ½ year is $(1.06)^7 \times 1.03$.

In other words the amount of \$1 for $7\frac{1}{2}$ years at 6% compounded yearly is $(1.06)^7 \times 1.03$.

Note that we *multiply* the amount of \$1 for 7 years by the amount of \$1 for $\frac{1}{2}$ year.

Example 1. Find the compound interest on \$2480 in 2 years and 73 days at 5% per annum, compounded yearly.

Amount of \$1 for 2 years $= (1.05)^2$.
Amount of \$1 for 73 days or 1/5 year is 1.01.
$\therefore$ amount of \$1 for 2 years and 73 days is $(1.05)^2 \times 1.01$.
$\therefore$ amount of \$2480 is $2480 \times (1.05)^2 \times 1.01 = \$2761.54$.
$\therefore$ interest $= \$2761.54 - \$2480 = \$281.54$.
Now do questions 1-17, page 185 text.

Grade IX Literature

AS YOU LIKE IT

As You Like It has been chosen to introduce our high school pupils to a reading of Shakespeare. It is a happy choice, for though it is not the finest of Shakespeare's comedies, nevertheless it is one of the sweetest and happiest. It will be regrettable if our first play is read in such a way as to create a distaste for Shakespeare. It should lead us to read more of his works for the pleasure of reading. Continued reading will give appetite for more reading and closer study, and so a treasure-store will be opened which cannot be exhausted in a lifetime. It is advisable to read the play through, orally and dramatically if possible, without any comment or pausing other than the occasional brief explanation of a passage. In any case, let different pupils read the parts of the chief characters in each scene. Young people always delight in the play when so read.

After a first rapid reading of the play, a preliminary discussion of the whole will be valuable before a second careful reading is begun. We might profitably discuss such topics as *the scene of the play, the theme, the characters, and the costumes.* After a second reading these topics should be again discussed more fully, for now our thought has been greatly enriched. We have come to visualize more clearly the natural beauty which largely formed the environment of the characters; we have come to understand the spirit which filled the dramatist as he created the scene and actors; we have entered more fully into the hearts of the characters.

1.—*The Scene.* One cannot hear *As You Like It* spoken of without thinking of its environment. When *A Midsummer Night's Dream* is mentioned we think of a moonlit wood; when it is *The Tempest*, we think of an enchanted island; when it is *Macbeth*, we think of a blasted heath; and when it is *As You Like It*, we think of the forest of Arden. Some authorities have identified it with the forest of Ardenne in northeastern France. Very likely Shakespeare did have this forest in mind when choosing the name, but that is as far as the identity goes. The forest is not a French forest, but a typically English one, such as had become a part of the poet's very being. His boyhood home was not remote from Sherwood Forest, the scene of the familiar romances of Robin Hood and his merry men. Near Shakespeare's own home in Warwickshire was a beautiful forest of Arden. His spirit roams again through these boyhood forest glades as he creates the haunts of the jovial Duke Ferdinand and his followers. He lives again among the giant oaks, the quiet streams, the osier beds, characteristic of the woods of the English Midlands. He would think of these things as the play unfolded itself, but he does not try to represent any particular place. His is a forest of the imagination; it is in a country of nowhere. Tufts of olives grow in glades typical, in other respects, of Warwickshire, and one may encounter among oaks and osiers a fierce lioness or a green and gilded snake.

There is little description in *As You Like It*, yet the scene impresses itself vividly upon us. Little references like those of Duke Senior (Fer-

dinand) when praising the life of the forest, or of the lords in conversation, or of the songs of Amiens make us feel the atmosphere of the "good greenwood" as certainly and as significantly as in the old ballads of Robin Hood and his merry men.

Every scene in the play is out-of-doors. The first scene is in Oliver's orchard or garden, the second is in an open space of Duke Frederick's grounds where there is room for the wrestling. The rest of the play, except for a brief return to the lawn of the Duke's palace (Act II, Scene II), is in the forest. By deleting the scene referred to the writer has produced the play on the stage with only one change of scene, and in a three-act arrangement.

2.—*The Theme.* The theme of the play is the spirit of forgiveness. This is the first of four plays in which Shakespeare treats this theme which seems to have been a favorite with him. The four, produced at various stages of his career, are *As You Like It, A Winter's Tale, Cymbeline,* and *The Tempest.* There is progressive improvement in his treatment, and he finally achieves near perfection in *The Tempest,* the last of his works.

In *As You Like It,* brother is estranged from brother, Oliver from Orlando and Duke Frederick from Duke Ferdinand. In each case a good person is done a great wrong. The dramatist fills their hearts with the spirit of forgiveness, and the course of events brings about reconciliation and happiness for all.

An equally apparent, but perhaps secondary theme of the play is the lesson that true happiness does not depend on outward circumstances. Duke Frederick had power and wealth, yet he was at odds with the world, jealous, mistrustful, and unhappy; Duke Ferdinand was forced to endure hardships of hunger, and the weather, and lack of the comforts of civilization, yet he was supremely happy. Similarly Oliver was unhappy in the midst of pleasant circumstances, but Orlando found happiness in adversity. Happiness is largely an inward thing proceeding from the intellect and feelings.

3.—*Imagine the characters as they would appear on the stage.* There is some indication of the personal appearance of some of them. Orlando's bearing is that of a young athlete: he is of slight build as compared with the "sinewy Charles", yet he "looks successfully". From what Rosalind and Celia say of him in Act III, Scene IV, we gather that his hair is reddish brown. He is gentle and valiant in demeanour.

Rosalind is more than common tall, fair-haired, and capable of a mannish manner. In spite, however, of her boasting of "her swashing and martial outside", and her ability to play the "saucy locket", she is very like a girl. She is somewhat taller than Celia, who is dark-haired and somewhat duskier in complexion:

> "The boy is fair,
> Of female favour, and bestows himself
> Like a ripe sister: the woman low
> And browner than her brother."

Frederick is cruel and capricious, Ferdinand is serene, Jacques is melancholy, and these strong traits are bound to show themselves in their faces. All three may well be imagined as on the downhill side of life.

Corin and Silvius are typical shepherds, a young man and an old. Silvius is apparently a rather handsome youth, for Rosalind (Ganymede) says of him:

> "You are a thousand times a properer man
> Than she a woman."

Phoebe is vividly described by Rosalind. She was somewhat of a rustic beauty with her inky brows, her black silk hair, her cheek of cream, and her bugle eye-balls. She is the pretty shepherdess of the dream pastoral; Audrey is the homelier country wench. "Bear your body more seeming, Audrey," says Touchstone who is under no delusion as to her ugliness.—"A poor virgin, sir, an ill-favoured thing, sir, but mine own."

4.—*Dress.* The following points should be noted regarding the dress which was doubtless the current mode of Shakespeare's day, for he speaks repeatedly of the "doublet and hose". Such a costume would be especially advantageous for a girl masquerading as a boy, for she would be able to delude her associates more easily as to her real sex because of the padded doublet and stuffed hose.

(1) All the men, except Touchstone and possibly Corin, would wear doublet and hose. The doublet was a hip-length jacket, padded about the breast and shoulders and tight at the waist. The bottom part consisted of a narrow skirt. The sleeves could be worn or removed. They were laced into the arm-holes with laces tipped by metal points. Similar laces were used to lace the doublet. Around the neck was a detachable ruff. Various colors were worn. In Shakespeare's day the fashion was trunk hose to clothe the lower part of the body. Tight hose were topped by full trunks which came to the centre of the thigh. The shoes were pointed and often decorated with slashes or rosettes.

(2) The upper part of the woman's dress was a bodice cut like the man's doublet, giving a long-waisted, stiffly-set appearance to the body. The sleeves contrasted with the bodice in color. The neck might be low in front, spreading up at the back into a high, wide color or ruff. The garment was laced up the front. Skirts were hooped, and were often cut away in the front, from the pointed waist-line to the hem, to show an underskirt of bright color.

(3) Touchstone wears the typical jester's costume—a jacket cut to points, a cape similarly cut, pointed cap and shoes, and bells on every point. The material would be "motley", that is, various colors.

(4) Possibly the favorite color of the courtiers masquerading as foresters would be Lincoln green. Hats generally were low crowned, narrow brimmed, and decorated with a single long feather.

(5) Phoebe and Celia as shepherdesses wear a tightly-fitting bodice ending at the waist-line, and a shortish skirt, full, but not hooped, and a rye-straw hat.

(6) Corin would probably wear a smock-like jerkin over the hose.

Look up in an encyclopedia, or some other source, an account of Elizabethan costumes, and try to obtain some pictures of the dress of men and women of various ranks.

5.—*Synopsis.* Fill out orally the details of the following synopsis of the play.

(1) Orlando ill-treated by his eldest brother.
(2) Orlando's life plotted against.
(3) Orlando flees to the Forest of Arden.
(4) Here he meets Duke Ferdinand and his followers.
(5) Rosalind and Celia seek refuge in Arden.
(6) Orlando and Rosalind have met at court.
(7) They meet again in Arden.
(8) Duke Ferdinand and his followers "fleet the time" in the forest.
(9) The jester woos the shepherdess.
(10) A disdainful shepherdess, loved by a faithful shepherd at last accepts his love.
(11) Orlando's wicked brother and Rosalind's wicked uncle are brought to repentance.
(12) A happy ending for all.

Act I.

After reading the Act carefully a second time and clearing up all textual difficulties, discuss the following questions:

1. What stir and excitement occur in Scene I to catch and hold the attention of the audience?

2. What reasons does Shakespeare impute to Oliver for wanting the whole of the estate left by his father and for mistreating Orlando?

3. At the beginning of the play it is necessary to convey a little information as to the past and present fortunes of the chief characters. What does Orlando tell Adam about himself and his brother, and in a very short conversation between Oliver and Charles, what is made known about Rosalind and her father?

4. Describe the interview between Charles and Oliver. How does Oliver make him willing to injure Orlando?

5. What better fortune comes to Orlando temporarily? How is it marred?

6. Describe the first meeting of Orlando and Rosalind. Later in the play Phoebe says: "Whoever loved that loved not at first sight?" Is it true as far as Orlando and Rosalind are concerned?

7. How is the impulsive nature of Rosalind shown in Scene II?

9. What new misfortune comes to Rosalind at the end of Act I?

9. Give Celia's description of the friendship between herself and her cousin. How does she prove herself a true friend?

10. What are their plans for leaving the court? Why did they choose the forest of Arden?

11. Learn the meanings of the following words. How do some of them differ from present-day usage? School, countenance, villain, emulator, contriver, practise, learn, reason (verb), ill-favoured, taxation, broth, prosper, envious, quintain, remorse.

12. Learn by heart:
"I was too young" to "coupled and inseparable".

13. Express the following passages in modern prose:
(*a*) "I am altogether misprized."
(*b*) "My father's rough and envious disposition
Sticks me at heart."
(*c*) "The duke is humorous, what he is, indeed,
More suits you to conceive than I to speak of."
(*d*) "We'll have a swashing and a martial outside;
As many other mannish cowards have,
That do outface it with their semblances."

ACT II

1. What is the banished Duke's attitude toward the splendor he has left and the adversity he has suffered?

2. The Duke says that Jacques is "compact of jars," that is, made up of discords. What pleases other men is distasteful to him; he finds pleasure in what gives them discomfort. Illustrate this from what he says and does in this Act.

3. Why does the lot of the court jester seem an enviable one to Jacques?

4. Give Jacques' description of the stages of human life. Does he show admiration of, or pleasure in the various stages?

5. Where does the melancholy of Jacques show itself?

6. How does Adam show his fidelity to Orlando?

7. Does Orlando appreciate Adam's fidelity?

8. How does Orlando meet the banished Duke, and how is he received by him?

9. Describe the arrival of Rosalind, Celia, and Touchstone in the forest.

10. How do the three obtain a dwelling?

11. Memorize:
(*a*) "Now my co-mates" to "I would not change it."
(*b*) "Today my lord of Amiens" to "dwelling-place."
(*c*) "Under the greenwood tree."
(*d*) "All the world's a stage" to "sans everything."
(*e*) "Blow, blow, thou winter wind."

12. What is the meaning of the following words: irks, fools, anon, cope, suddenly, inquisition, meed, fantasy, churlish, recks, erewhile, uncouth, conceit, embossed, bravery, saws, modern.

13. What is meant by (*a*) the music of the spheres, (*b*) an island bred man, (*c*) a dry brain?

14. Express in good modern prose:
(*a*) "O, what a world is this, when what is comely
Envenoms him that bears it."
(*b*) "He is too disputable for my company."
(*c*) Thy conceit is nearer death than thy powers."
(*d*) "Mine eye doth his effigies witness
Most truly limn'd and living in your face."

Science Tests

Grade IX

1. Make a numbered list of the words or phrases necessary to complete each of the following statements correctly.

(*a*) The internal features of a bean seed are (1).....
(*b*) One may test for carbon dioxide by (2).....which turns (3).....if CO_2 is present.
(*c*) Germinating seeds give off (4).....
(*d*) One of the foods found in the seed of plants is (5)..... This may be proven by testing it with (6)....., which will turn (7).....if it is present.
(*e*) The taking-in of water through the roots and passing it off through the leaves of plants is known as (8).....
(*f*) Osmosis is the process by which plants (9).....
(*g*) The process by which plants unite carbon dioxide and water to form (10).....is known as (11).....
(*h*) The process of respiration in the plant is that process by which the plant (12).....
(*i*) The chief function of the stems of plants is to (13).....
(*j*) Two functions of the leaves of plants are to (14)..... (15).....
(*k*) The openings in the leaves of plants through which water is given off are known as (16).....
(*l*) The flower of the plant is (17).....
(*m*) The four main parts of a flower are (18).....
(*n*) Pollination in the plant is (19).....
(*o*) Fertilization in the plant is (20).....

See page 38 for answers.

2. Describe a method by which you might determine the percentage germination of a sample of rusted wheat which is to be used for seed.

Grade X

1. (*a*) Write a short essay on the molecular theory of the structure of matter.
   (*b*) Name some experimental evidence that matter is constructed of molecules.
2. (*a*) Name four sources of energy from which heat may be obtained.
   (*b*) Describe the effect of heat on (*i*) solids, (*ii*) liquids, (*iii*) gases.
3. (*a*) Name the two different thermometer scales and describe the fixed points on each.
   (*b*) Change 20°C to the Fahrenheit reading.
   (*c*) Change 97°F to the Centigrade reading.

4. Name and describe three methods by which heat may be transferred from a hot stove in a room to a person sitting before it.

Grade X Written Language

SOME FORMS OF DESCRIPTION

Model 1. *A Scene from Tropical Nature.*

"The road up to this lean man's house is uphill all the way and through forests. The forests are of great trees, not so much unlike the trees at home, only here and there are some very queer ones mixed with them, cocoanut palms, and great forest trees that are covered with blossoms like red hawthorn, but not nearly so bright; and from all the trees thick creepers hang down like ropes, and nasty-looking weeds, that they call orchids, grow in the forks of the branches; and on the ground many prickly things are dotted, which they call pine-apples. I suppose everyone has eaten pineapple drops . . . "—*Robert Louis Stevenson: Letters.*

Analysis.

1. Note the striking first sentence.
2. Note the easy, conversational style and comparisons.
3. Details—great trees compared with trees at home; cocoanut palms; blossom-like red hawthorn; creepers like ropes; nasty-looking weeds (orchids); prickly things called pineapples.
4. Note the deft touch of humour in the closing sentence.

Exercises

Write a paragraph of similar or greater length on each of the following topics. You may use the first sentence suggested. Think up a wealth of details before beginning, and use some comparison:

1. An Old House.
   The old house is very homelike.
2. A Snowstorm.
   Already the ground was covered by a white mantle, filling the ruts in the road and blotting out landmarks.
3. A Shower.
   We had been hopeful that we would finish our picnic before the threatened shower burst upon us, but such was not to be our good fortune.
4. A Disorderly Room.
   Never before have I seen a room in which everything was in such disorder.
5. A Dinner Table.
   The table was loaded with all good things imaginable.

Model 2. *A Scene from Life.*

"The family meeting was warm and affectionate. As the evening was far advanced, the squire would not permit us to change our travelling dresses, but ushered us at once to the company, which was assembled in a large old-fashioned hall. It was composed of different branches of a numerous family connection, where there was the usual proportion of old uncles and aunts, comfortable married dames, superannuated spins-

ters, blooming country cousins, half-fledged striplings, and bright-eyed boarding-school hoydens. They were variously occupied; some at a round game of cards; others conversing around the fire-place; at one end of the hall was a group of the young folks, some nearly grown up, others of a more tender and budding age, fully engrossed by a merry game; and a profusion of wooden horses, penny trumpets, and tattered dolls, about the floor, showed traces of a troop of little fairy beings, who, having frolicked through a happy day, had been carried off to slumber through a peaceful night."—*Washington Irving.*

Analysis.

1. Introductory.—General impression, "warm and affectionate."
2. Details.—Note that the general impression expressed in the first sentence prevails throughout the paragraph. The details include: a warm welcome; old uncles and aunts, comfortable married dames, and so on; their occupations (all harmonious).
3. Note the interesting manner in which the children are referred to. Note also the melody of this closing sentence.

Exercise

Write a similar picture of each of the following:

1. A Busy Household.
2. A Lively Playground Scene.
3. A Christmas Party.
4. A Hallowe'en Party.

Model 3. A Character Description.

"It was really delightful to see the old squire seated in his elbow chair, by the hospitable fire-place of his ancestors, and looking around him like the sun of a system, beaming warmth and gladness to every heart. Even the very dog that lay stretched at his feet, as he lazily shifted his position and yawned, would look fondly up in his master's face, wag his tail against the floor, and stretch himself again to sleep, confident of kindness and protection."—*Washington* Irving.

Analysis.

1. General impression, kindly, genial old squire.
2. The details emphasize this impression—the comparison in sentence 1; the dog's attitude toward him.

Model 4. *An Odd Personage* (*A Portrait*).

"The mirth of the company was greatly promoted by the humours of an eccentric personage whom Mr. Bracebridge always addressed with the quaint appellation of Master Simon. He was a tight, brisk little man, with the air of an arrant old bachelor. His nose was shaped like the bill of a parrot; his face, slightly pitted with the small-pox, with a dry bloom on it like a frost-bitten leaf in autumn. He was evidently the wit of the family, dealing very much in sly jokes with the ladies, and making infinite merriment by harpings upon old themes; which, unfortunately, my ignorance of the family chronicles did not permit me to enjoy.

He was the idol of the younger part of the company, who laughed at everything he said or did, and at every turn of his countenance. I could not wonder at it; for he must have been a miracle of accomplishments in their eyes. He could imitate Punch and Judy; make an old

woman of his hand, with the assistance of a burnt cork and pocket handkerchief; and cut an orange into such a laughable caricature that the young folks were ready to die with laughing."—*Washington Irving.*

Exercises

1. Analyze model 4 (both paragraphs) so as to list the details (1) of appearance; (2) of accomplishments.
2. Write a similar portrait of some person of out-of-the-ordinary personality, either a real or fictitious character.
3. Write a portrait of one of your acquaintances. Do not mention real names, and be careful to say nothing unkind or unpleasant.
4. Write a description of some animal to show intelligence.
5. Write a description of someone you know to emphasize either (1) gruffness, (2) clumsiness, (3) kindness, (4) wittiness, (5) joviality, (6) or any other predominating trait.

Word Practice

Note the difference in meaning of the following groups of words. Use your dictionary. The first is given as an illustration.

1. Admittance, admission. *Admittance* refers to place. *Admission* refers also to place, but more frequently to privileges, favor, position, rate. "Admission—fifty cents. No admittance without tickets."

2. angry, mad
3. accept, except
4. around, about
5. way, ways
6. some place, somewhere
7. beside, besides
8. between, among
9. by, near, at
10. calculate, reckon
11. can, may
12. suppose, think, guess
13. character, reputation
14. contemptible, contemptuous
15. counsel, council, consul
16. distance, way
17. affect, effect
18. esteem, estimate
19. few, less
20. funny, curious
21. habit, custom
22. almost, most
23. human, humane
24. illusion, allusion
25. illusive, illusory
26. immigrant, emigrant
27. invent, discover
28. lay, lie
29. learn, teach
30. leave, let
31. lend, loan, borrow
32. like, as
33. likely, liable
34. loose, lose
35. many, much, a great deal of
36. neither, none
37. number, quantity, amount
38. it's, its
39. part, portion
40. party, person
41. raise, rise
42. real, very
43. regard, respect
44. relative, relation
45. remainder, balance
46. remember, recollect
47. remit, send
48. repair, fix
49. sit, set
50. stop, stay
51. suspect, suspicion
52. when, while
53. without, unless
54. comparison, contrast
55. any, either

Exercise

Fill in the blanks in the following with the correct word. The number indicates the group above from which the selection is to be made.

1. They charged me twenty-five cents.....(1).....to the game.
2. She is.....(2).....because I received higher marks than she.
3. My mark is.....(4).....ninety.
4. She.....(49)..... .....(7).....me every day.
5. I have three books and two pads.....(7).....
6. I think there ought to be an agreement.....(8).....the members of the class.
7. "Hello, Jack, how is it.....(9).....you?" called Fred.
8. He is.....(50).....at his sister's.
9. I.....(12)..... we shall .....(34)..... the game.
10. I.....(12).....I shall go.
11. I.....(12).....that kind of play will win.
12. Any boy.....(11).....play or not, as he chooses.
13. How.....(11).....a fellow pass if he never has a chance to recite?
14. A good.....(13).....should give a man a good.....(13)
.....
15. We found seven points of difference in.....(54).....them.
16. Our.....(54).....revealed several differences and similarities.
17. A new.....(15).....to London has been appointed.
18. We held our.....(15).....at 9 o'clock.
19. He gave me wise.....(15).....
20. He was proud and.....(14).....
21. They walked a long.....(5).....together.
22. What.....(17).....did the medicine have upon you?
23. His.....(13).....in the community is excellent.
24. We all.....(3).....our marks in silence.
25. There are.....(19).....pupils absent than yesterday.
26. You should form the.....(21).....of getting up early.
27. His treatment of his dog is not.....(23).....
28. His.....(24).....was to a poem of Tennyson.
29. Marconi.....(27).....wireless telegraphy.
30. He.....(26).....from England to Canada.
31. .....(28).....down Fido.
32. I.....(28).....for an hour. (Past tense)
33. He.....(29).....more than any teacher I ever had.
34. Please.....(30).....me go to the theatre.
35.....(11).....I have the.....(31).....of five dollars?
36. He will.....(31).....fifty cents.
37. He did his work.....(32).....me.
38. They walk.....(32).....we do.
39. I think you are.....(33).....to succeed.
40. You will.....(34).....your purse if you are not careful.
41. We are.....(22).....there now.
42. .....(55).....of the five boys.....(11).....go.
43. .....(36).....of the two sisters is coming.
44. What.....(37).....of marbles have you in your hand?
45. Cut the cake into.....(39).....and take your.....(39).....
46. He is a congenial.....(40).....to have around.
47. The sun.....(41).....at six o'clock.
48. The child.....(41).....quickly and hurried home.
49. We had a.....(42).....good time at the party.

50. He does not.....(43).....the truth.
51. The.....(44).....(49).....and wept aloud.
52. The.....(45).....of the season is.....(33).....to be rainy.
53. I.....(46).....the affair but I cannot.....(46).....the person who presided.
54. They .....(47)..... the goods and I .....(47)..... the money by return mail.
55. Please.....(48).....my shoe as soon as possible.
56. .....(49).....on the floor, if you are not comfortable there.
57. She.....(50).....there three months last season.
58. I always.....(51).....him of being dishonest.
59. .....(52).....we were playing it began to rain.....(42).....hard.
60. I am not going.....(53).....you do.

Grade X Literature

JULIUS CAESAR

Review Questions (Acts II, III)

1. Show from Brutus's soliloquy in Scene I, Act II that the insidious words and actions of Cassius have destroyed the soundness of his judgment.

2. How often in this scene is Brutus's loss of sleep referred to? What does this show of his character and attitude of mind?

3. State in good prose what was probably said between Cassius and Brutus in the whispered conversation. (Recall that Cassius had attended a meeting of the conspirators just before visiting Brutus). What is the purpose of the conversation regarding the position of the sunrise?

4. Review the conversation between Brutus and Portia to show what it reveals of her character? Of Brutus's character?

5. Why is Caius Ligarius introduced at the end of this scene?

6. Discuss Scene II under the following headings:

(1) "He hath superstitious grown of late."
(2) The effect of the scene on the audience.
(3) Caesar, an autocrat.
(4) Caesar's ambition.
(5) Caesar, the shrewd politician.

7. What two purposes does the Artemidorus scene fulfil? *Hint*: The conspiracy has leaked out; apprehension of the audience: will Caesar be warned and so escape?

8. How does Portia's attitude in Scene IV contradict the confidence in herself which she gave expression to in Scene I?

9. Discuss the dramatist's skill in preparing the audience for Caesar's death by developing the following points:

(1) He has created a sentiment against Caesar.
(2) He has made Caesar a very human person who believes himself a god, and is therefore to be brought low. (Go carefully into the details of this).

10. Suppose yourself sitting in the audience viewing a production of this play. What has occurred to heighten your interest as the time of the assassination draws near? Write out your answer in good prose, using the following suggestions:

(1) Suspense due to
  (*a*) Warning of the soothsayer repeated.
  (*b*) Portia's nervous fear.
  (*c*) The letter of Artemidorus.
(2) Stage effects—thunder and lightning.
(3) Caesar's superstitions.
(4) The hesitancy of Caesar: will he go to the meeting of the Senate?
(5) The fears of the conspirators. They may be prevented.

11. What difference in temperament between Cassius and Brutus is shown by the Popilius Lena incident?

12. What political cleverness does Antony show following the assassination?

13. Show by reference to the speeches of Brutus and Antony how and why the fortunes of the conspirators begin to decline at the end of Antony's speech.

14. From the moment of the assassination to the end of the play Shakespeare no longer emphasizes the weaknesses of Caesar. He now reveals his true greatness. The spirit of Caesar lives on to overwhelm Brutus and Cassius, representing the forces opposed to Caesar—republicanism versus autocracy. Indicate carefully what marks of the true greatness of Caesar are set forth in Act III following the assassination.

15. What subtle suggestion does Antony use which the mob finally acts upon? Quote and memorize the lines containing this suggestion. What other subtleties does he employ?

Act IV

Scene 1. Shakespeare represents this scene as taking place in a house in Rome immediately after Caesar's assassination. He further represents Octavius as immediately leaguing himself with Antony and Lepidus, who was commander of Caesar's cavalry. Here for the sake of a good play the dramatist departs from historical fact. The meeting here referred to took place on an island in a river near Bologna, North Italy. For nearly a year following Caesar's death Antony and Octavius were in disagreement. They eventually buried their differences and united forces against Brutus and Cassius. In this scene Shakespeare analyzes the inner personal and human motives lying behind historical actions—an illustration of the dictum that literature is truer than history, for scientific historical method seldom makes such an analysis.

Note.

(1) The business in hand. The three are consolidating their position and planning the destruction of potential enemies by the familiar method of proscription. That is, those whom they sought to destroy were listed and then from time to time, as opportunity presented itself, assassins appointed for the purpose did their deadly work.

(2) The ruthlessness of these men. They have personal grudges to work out. They bargain human lives with one another to serve individual personal ends. Octavius demands the death of the brother of Lepidus, and the latter is willing to sacrifice his own brother to secure the death of a personal enemy who was Antony's nephew. The bargain is made.

(3) The selfish motives of Antony are revealed. That will he used so effectively to win the support of the people now becomes the object of personal greed. His noble sentiments of love for the people are now forgotten and he is ready to betray them.

(4) The discussion regarding Lepidus. This foreshadows a historical event. After the defeat of Brutus and Cassius, a triumvirate, the second to rule Rome, was set up. This consisted of the three in this scene. Lepidus, however, was soon squeezed out of his place of power and the

rule was divided between Octavius and Antony. Note the selfish ambitions of Antony and the unscrupulousness of his treatment of Lepidus who was useful as a skilled general, but tractable and not likely to stand in the way of Antony's ambitions.

There is a suggestion that Antony and Octavius will not always work in harmony. Antony shows his dominant nature. The younger Octavius has not yet shown his spurs, but he dares to recognize the worth of Lepidus and to express a mild opposition to Antony. In this connection recall Antony's shrewd handling of the mob. He is always unscrupulous in working out his designs.

(5) Practical plans to meet Brutus and Cassius. Immediate action is necessary. Wariness characterizes their plans.

Scene II. The action of the play now shifts to the eastern dominions of Rome. Brutus and Cassius fled to the east following the assassination of Caesar, for there each had formerly ruled and they could count on the support of many friends. We are now in the midst of military activity, and first get a view of the forces of Brutus and Cassius at Sardis in Asia Minor.

Note.

(1) Cassius is bringing his forces to unite with those of Brutus at Sardis.

(2) There is disagreement between the two generals. This division between them prepares the audience for the ultimate disaster which comes to them. Brutus complains that Cassius, either through his own acts or through unworthy officers who have his support, has done things which injure their cause.

(3) Lucilius reports a Cassius not so friendly as of old. Note the high regard in which Pindarus holds Cassius. The reason for this becomes apparent later, but then there was much that was fine about Cassius.

(4) Cassius' entrance. The fiery Cassius immediately shows his anger. Note the calmness of Brutus and his good advice to Cassius. They must not exhibit their differences before their soldiers lest they destroy the confidence of the men in their leaders. Their differences must be discussed quietly.

Scene III. The Quarrel Scene. This is one of the most effective scenes of the play. Here the fineness of Brutus's character is laid bare—his endurance of suffering, his gentleness, his idealism which made him a poor leader in a world of intrigue and selfishness.

Note.

(1) Cassius' complaint. Brutus had punished Lucius Pella, a friend of Cassius, for taking bribes from certain people of Sardis, and had adhered to his decision in spite of representations made by Cassius. It is easy to imagine the situation. The armies had to be equipped, provisioned, and supported. Lucius Pella, an officer charged with directing these things, had sought to enrich himself by collusion with those who would profiteer or evade their contributions. Brutus's firm action seems not only right, but good policy.

(2) Cassius believes in what we call political expediency. His argument is that because of the difficulty of their situation they could not afford to make enemies. He says:

"In such a time as this it is not meet
That every nice offence should bear his comment."

Paraphrased this means: In a difficult situation such as we find ourselves in, it is not fitting that every trivial offence should be noticed.

(3) Brutus seems slightly angered at Cassius' suggestion of winking at evil. He frankly tells Cassius that many accuse him of a desire to profit from the conditions by selling the offices at his disposal.

(4) Note the much more impetuous, uncontrolled Cassius. He goes so far as to imply a threat to Brutus's life.

(5) "Remember March, the ides of March remember." Consider carefully the persistence of Brutus's ideals, yet he is still blinded by his own goodness. He cannot yet see that the motives of Cassius and others in destroying Caesar were not as noble as his own. He pays tribute to Caesar as "the foremost man of all this world" whom he had struck down for supporting robbers. How unworthy then for them to accept bribes or condone those who do! Such a man is less than a dog.

(6) Cassius' anger rises to the point where he almost loses control of himself. Brutus remains calm. Cassius again threatens Brutus.

(7) Brutus professes to disdain Cassius. His anger rises slightly, and he makes Cassius an object of ridicule.

(8) "Is it come to this?"

Cassius undoubtedly loved Brutus, therefore nothing could more readily cool his anger than a feeling that Brutus had withdrawn his love and respect. He begins to hedge, but still continues to threat.

(9) Brutus now offers a real complaint to Cassius.

(*a*) He had requested money to pay his troops from resources which Cassius had.

(*b*) He could not oppress the people of the country to get money. Note his kind, but unpractical nature.

(*c*) Cassius denies the accusation and claims that he was misreported.

(10) Cassius' anger begins to cool, but not his emotion. He breaks down under Brutus's overmastering righteousness and becomes deeply dejected at the thought that he has lost Brutus's love. Cassius here indicates a fatal weakness in his character. He is a man of extreme emotions—easily angered, easily depressed. He sincerely loves Brutus and would rather die than lose the love of Brutus.

(11) Brutus is ever gentle. His natural kindness soon gains control.

"O Cassius, you are yoked with a lamb
That carries anger as the flint bears fire;
Who, much enforced, shows a hasty spark,
And straight is cold again."

(12) The incident of the entrance of the poet rather detracts from the scene and is better omitted. Most modern productions of the play delete these lines.

(13) The drinking of wine was a pledge of friendship. Recall that Caesar, not knowing the designs on his life, invited the conspirators to drink wine "and we, like friends, shall go along together." Brutus now

calls for wine to renew the pledge of friendship. Brutus tells Cassius the news of Portia's death, the grief of which he had hidden so stoically. It is a wonder to Cassius that, under the circumstances, Brutus should have such self-control as to refrain from killing him. Such remarkable self-control quite overpowers Cassius. His admiration for Brutus regains all its old fervour.

"Fill, Lucius, till the wine o'erswell the cup;
I cannot drink too much of Brutus' love."

Note that Portia's confidence in her ability to endure the burdens Brutus was carrying has been utterly betrayed. Worry has led to madness, and madness to suicide.

Cassius seems more downcast because of the death of Portia than does Brutus. He controls his grief and sets about the practical business of military preparations.

(14) News from Rome.

(*a*) Antony and Octavius are marching toward Philippi in Macedonia.

(*b*) Many senators have been put to death by the triumvirate, Cicero being one.

(*c*) Brutus forces from Messala the news that Portia was dead after denying that he had any news of her. He probably took this means of verifying his own report.

(15) Cassius says in reference to Brutus's endurance of his sorrow:

"I have as much of this in art as you,
But yet my nature could not bear it so."

Paraphrased this means: "I am as familiar with the stoic philosophy which teaches uncomplaining endurance of pain, but my nature would not let me live up to it as you do."

(16) The decision regarding Philippi. What was Brutus's opinion? Cassius' opinion? Brutus is the dominant leader, but as before, his decision proves a mistake of policy.

Brutus and Lucius.

(1) Note the love and gentleness of Brutus. His attitude toward the servant boy is that of a father rather than of a master.

(2) Brutus is the intellectual, lover of beauty, the student, more at home with music and books than amid practical affairs.

Memorize the passage: "This is a sleepy time . . . . " to "Here it is, I think."

(3) The scene and music create the atmosphere for the appearance of Caesar's ghost. This apparition is a reflection of Brutus's realization of Caesar's greatness and a premonition of the eventual conquest of Caesar's spirit, the force of imperialism.

Problems

1. Describe the quarrel scene in such a manner as to demonstrate the essential difference of character of Brutus and Cassius.
2. Analyze the scene between Brutus and Lucius in such a manner as to show the sympathetic understanding between the two, the tenderness of Brutus, and the devotion of Lucius.
3. Discuss the question: Sardis or Philippi?
4. What causes had Cassius for resentment against Brutus?

Grade XI Algebra

QUADRATIC EQUATIONS

A quadratic equation is an equation that contains the unknown to the second power and to no higher power.

In the solution of problems we have already seen that the use of the algebraic equation is very helpful. Thus, if I sold an article for $20 and gained 10% I can find the cost by means of an algebraic equation. I can let the cost price be $x. Then, since the gain is calculated on the cost, the selling price will be 110% of the cost; that is, the selling price is 110/100 x. Hence we are now able to write the equation $110/100x = 20$ from which we are able to find x to be $20 \times 100/110 = 18\ 2/11$. Here our equation is of the first degree.

Not infrequently the equation involves the square, the cube, or the fourth power of the unknown. When the equation involves the cube of the unknown it is called a cubic equation, when it involves the fourth power it is called an equation of the fourth degree. Equations of the third or fourth degree are not always capable of being solved by the means available to Grade XI students. The quadratic equation or the equation of the second degree, however, can always be solved by elementary means.

In the problem, the sum of a number and its square is 56, find the number, if we let the number be x, then the equation is $x^2+x=56$. We must now solve this equation. The equation may be written $x^2+x-56=0$. Factoring the left-hand side we get $(x+8)(x-7)=0$. Here we have two factors whose product is zero. When the product of two factors is zero, either one of the factors must be zero. Thus ab can only equal zero when either a or b is zero. Hence in the above equation either $x+8$ or $x-7$ is zero. If $x+8=0$, then $x=-8$. If $x-7=0$, then $x=7$. The number in the problem, therefore, is either -8 or 7. Here, then, we solved the quadratic equation $x^2+x-56=0$ by *factoring*.

Sometimes a quadratic equation cannot be solved readily by factoring, so we employ the method known as *completing the square*. As the name suggests, in this method we so arrange the equation that we have a square on each side of the equality sign, or at least we have a square on the side which involves x.

The expressions x^2+4x+4, $x^2+8x+16$, and $x^2-5x+25/4$ are squares of $x+2$, $x+4$, and $x-5/2$. Note that in the squares, the absolute terms, that is, the terms that do not contain x, are equal respectively to the squares of one-half the coefficient of x. Thus we see that 4 is $(\frac{1}{2}\times 4)^2$ and 16 is $(\frac{1}{2}\times 8)^2$ and 25/4 is $(\frac{1}{2}\times 5)^2$. Note also that this is true only when the coefficient of x^2 is 1.

So in the equation $x^2+x=56$ we complete the square on the left by adding to x^2+x one-half the coefficient of x squared, that is, $(\frac{1}{2}\times 1)^2 = \frac{1}{4}$. If we add $\frac{1}{4}$ to the left side, we must also add it to the right side to keep the equation balanced. Hence

$$x^2+x+\tfrac{1}{4}=56+\tfrac{1}{4}=\frac{224+1}{4}=\frac{225}{4}$$

Now we take the square root of both sides and get $x+\frac{1}{2} = \pm\sqrt{\ }\ 15/2$ (1).

From (1) we get two equations of the first degree, namely, $x+\frac{1}{2}=15/2$ and $x+\frac{1}{2}=-15/2$. From these we get $x=14/2$ or 7 and $x=-16/2$ or -8.

Solving the equation $3x^2+16x-99=0$ by factoring we get $(3x-11)(x+9)=0$, whence $3x-11=0$ or $3x=11$ or $x=11/3$; and $x+9=0$ or $x=-9$.

Solving the equation $3x^2+16x-99=0$ by completing the square, we must first reduce the coefficient of x^2 to unity, that is, 1. We can do this in an equation by dividing through by 3. Thus $x^2+16/3x-33=0$, or $x^2+16/3x=33$.

To complete the square we must add to both sides one-half the coefficient of x squared. The coefficient of x in the equation is 16/3. One-half of 16/3 is 8/3. This squared is 64/9. Students sometimes take 16/6 as one-half of 16/3. As a result, however, in the subsequent manipulations they frequently make errors. Students are therefore advised to reduce the fraction to its lowest terms before squaring it. Hence $x^2+16/3x+64/9=33+64/9$

$$=\frac{297+64}{9}$$

$$=\frac{361}{9}$$

$$\therefore\ x+8/3=+19/3$$

$\therefore$ $x=11/3$ and $-27/3$ or -9

To get the required drill in solving quadratic equations by the methods of factoring and completing the square, do questions 20-27, page 244 and questions 15-23, page 247.

The quadratic equations we have dealt with above have been of the form $3x^2+14x-24=0$. Here we note that we have a term containing x^2, one containing x, and one in which the unknown does not appear. These terms are called, respectively, the x^2 term, the x term, and the absolute term. If we write the quadratic equation in the form $ax^2+bx+c=0$ we have a form into which all quadratic equations may be reduced. Here we see that a is the coefficient of x^2, corresponding to 3 above, b the coefficient of x corresponding to 14 above, and c the absolute term corresponding to -24 above. If c is zero the equation becomes $ax^2+bx=0$ and if both b and c are zero the equation becomes $ax^2=0$. However, a cannot equal zero, for then you would not have a term containing x^2 and hence you would not have a quadratic equation.

We say that $ax^2+bx+c=0$ is the *standard form* of the quadratic equation. Now let us solve this equation by the method of completing the square.

$$ax^2+bx+c=0$$

$$x^2+\frac{bx}{a}+\frac{c}{a}=0$$

Note that we divided through by the coefficient of x^2, namely a. We now transpose the absolute term c/a to the right, thus,

$$x^2+\frac{bx}{a}=-\frac{c}{a}$$

We now complete the square on the left-hand side by adding to both sides one-half the *coefficient* of x squared. The coefficient of x is b/a.

One-half the coefficient is $\frac{1}{2} \times b/a = b/2a$. This squared is $b^2/4a^2$. Hence we have

$$x^2 + \frac{bx}{a} + \frac{b^2}{4a^2} = -\frac{c}{a} + \frac{b^2}{4a^2}$$

$$= \frac{b^2 - 4ac}{4a^2}$$

Now we take the square root of both sides and get

$$x + \frac{b}{2a} = \frac{\pm\sqrt{(b^2 - 4ac)}}{2a}$$

Now suppose we transpose b/2a to the right, whence we get

$$x = -\frac{b}{2a} \frac{\pm\sqrt{(b^2 - 4ac)}}{2a}$$

That is, $x = \dfrac{-b \pm \sqrt{(b^2 - 4ac)}}{2a}$

Note that $-b \pm \sqrt{(b^2 - 4ac)}$ is *all* over 2a.

Here then we note that in the equation $ax^2 + bx + c = 0$, by manipulating the coefficients and the absolute term in a particular way we can find the value of the unknown in the equation. Thus if we take the coefficient of x, change its sign and add to or subtract from it the square root of a quantity equal to the square of the coefficient of x less 4 times the product of the coefficient of x^2 and the absolute term and divide the whole result by twice the coefficient of x we get the value of the unknown or the *root* of the equation.

Now let us solve $3x^2 - 14x - 24 = 0$ by this method. First we recognize that, comparing this equation with the standard quadratic, $a = 3$, $b = -14$, and $c = -24$.

$$\text{Hence } x = \frac{-14 \pm \sqrt{(196 - 288)}}{6}$$

$$= \frac{14 \pm \sqrt{484}}{6}$$

$$= \frac{14 \pm 22}{6}$$

$\therefore x = 36/6 = 6$ and $-8/6$ or $-4/3$.

Sometimes the values of the unknowns in some equations are not exact values. Thus in the equation $3x^2 + 5x - 3 = 0$,

$x = \dfrac{-5 \pm \sqrt{(25+36)}}{6} = \dfrac{-5 \pm \sqrt{61}}{6}$. Hence the values of x are expressed as surd quantities. We could find the square root of 61 to any number

of decimal places and thus get approximate values for c to any degree of exactitude.

We call $x=\frac{-b+\sqrt{(b-4ac)}}{2a}$ the *formula*. Hence this method of solving quadratic equations is known as solving by means of the formula. You have now had three methods of solving quadratic equations. You should know all three thoroughly.

As a drill on the use of the formula do questions 3-38, pages 271 and 272.

We sometimes solve equations of a higher degree than the quadratic by the methods adopted above in solving the quadratic. Thus

$$x^4-5x^2+4=0$$
$$(x^2-4)(x^2-1)=0$$

Whence $x^2-4=0$ and $x^2-1=0$

$$(x+2)(x-2)=0 \text{ and } (x+1)(x-1)=0$$
$$x+2=0,\ x-2=0,\ x+1=0,\ x-1=0.$$
$$x=-2,\ 2,\ -1, \text{ and } 1.$$

We could use the formula, too, in solving this question, making x^2 our unknown, thus

$$x^2=\frac{5+\sqrt{(25-16)}}{2}=\frac{5+\sqrt{9}}{2}=\frac{5+3}{2}=4 \text{ or } 1$$

$\therefore\ x=+2$ or $+1$.

Now do questions 2-12, page 275. The student should also do a fair percentage of the problems in the text leading to quadratic equations.

Grade XI Physics

A STUDY OF LIGHT

1.—Light. To most people light is that energy which falling on the retina of the eye produces the sensation of seeing. Physically such light is known as visible light. The physicist recognizes this visible light as a small band of the total physical light which extends from the invisible and very long radio waves to the equally invisible and very short X-rays and cosmic rays. To define visible light physically we may state that it consists of electromagnetic waves of from 0.00004 cm. to 0.000068 cm. in length, which, falling on the retina of the eye produce the sensation of sight. It is such visible light that it is intended to deal with in this part of the physics course.

2.—What Light Is. Some years ago it was believed that light consisted of small corpuscles or bodies emitted from the source of light, which travelled in straight lines. As knowledge of the phenomena of refraction of light was obtained by experiment this older corpuscular theory was abandoned in favor of the wave theory. This wave theory claimed that light was electromagnetic waves, originating from electromagnetic vibrations set up in the source. Such a theory is held largely at the present time but of late years new facts that have been determined tend to prove that light has both corpuscular and wave properties. Thus a new theory called "The Quantum Theory of Light" has come forward and is rapidly becoming accepted by all physicists. One may say simply that the real nature of light is not at the present time completely understood. It will be sufficient for our purposes if we accept the wave theory with the reservation that it is not the last word as regards the nature of light.

3.—How Light Travels. Let us suppose that we have a source of light from which electromagnetic waves are being emitted. These waves will travel in ever-increasing spheres outward from the source. The light coming to our eye will move along a straight line known as a light ray from the source to our eye. Since it is necessary for all waves to have some substance in which to vibrate in order to travel, the physicist has supposed a material to carry light which he called "ether". The existence of such ether has never been established experimentally, but for our purposes we may leave quarrels as to whether ether really exists to Doctors of Philosophy working in the Universities. Summing up, we may state that *light travels by means of electromagnetic waves, along straight lines called rays through a supposed substance called ether.*

Proof of the fact that light travels in straight lines is easily seen in the images formed of objects by rays of light travelling through a pinhole; in the ordinary shadows cast by opaque bodies; and in the more grand shadows of the earth on the moon and of the moon on the earth as they intercept the rays of light from the sun at times of eclipses of the moon and sun respectively.

4.—Law of Inverse Squares. It is elementary knowledge that the light falling on a printed page held close to a light is more intense than

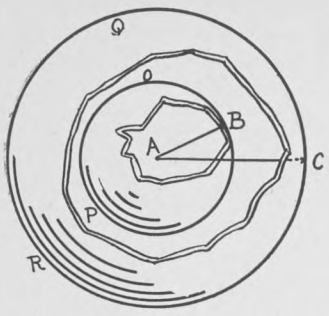

Fig. 1
The Inverse Square Law

that falling on the same page when held at a considerable distance. In order to understand just how this intensity varies suppose a source of light to be at a point A (Fig. 1) and BOP to be a sphere with radius AB equal to one unit of distance about it. The light from A will then illuminate the inner surface of this sphere, that is, an area of $1^2\pi$ or π. Again when light from the same source falls on the inner surface of the sphere CQR of radius AC equal to two units of distance, it will illuminate the inner surface of that sphere, an area $2^2\pi$ or 4π. Thus the illumination from the same source is spread over an area four times as great when the distance from the source is two times as great. It will thus be seen that the amount of illumination falling on a unit area of surface in the second case is just one-fourth as much as in the former case. Similarly at a distance of three units from the source the amount of illumination on a unit area of surface would be one-ninth of that on the unit area at a distance of one unit. From these considerations it follows that *the intensity of illumination varies inversely as the square of the distance from the source of light.* This fact may possibly be better seen in the following tabular arrangement.

Distance from Source	1	2	3	4	5	Units of length
Area Illuminated	π	4π	9π	16π	25π	Units of area
Illumination per Unit Area	1	¼	1/9	1/16	1/25	

5.—Luminous Intensity of Light Source. The amount of light falling on any given area depends not only on the distance of the area from the source, as explained in the last section, but also on the strength or luminous intensity of the source itself. Thus a room is better lighted by a 100 watt electric or a modern gas lamp than it is with a kerosene lamp or a candle. It is necessary that luminous intensities of various light sources be measured in some manner. This is done by comparing the source to be measured with a standard source by means of an instrument known as a photometer. The standard sources used vary in different countries. The oldest of these standards is the British Standard Candle, which is a sperm candle made in accordance with standard specifications. In spite of precautions taken to insure a constant source, the intensity of such a candle burning will vary by as much as 5%. Because of this a series of standard incandescent electric lamps have been adopted by the British Empire, the United States, and France. This unit of light intensity is called the *International Candle.*

6.—Bunsen Grease-Spot Photometer. All instruments used to compare the intensity of two sources of light are known as photometers. One of the simplest of these is the Bunsen Grease-Spot Photometer. It consists simply of a white paper screen with a small translucent spot, the grease-spot, at its centre. When this screen is placed between two light sources which are to be compared, the light falling on the side of the screen receiving the strongest illumination is transmitted through

the grease-spot, thus showing it up as a lighter spot on the opposite side of the screen. The screen is then moved between the two light sources until the spot disappears, at which time the illumination on the opposite sides of the screen is equal.

7.—Using the Grease-Spot Photometer. Let us suppose that the paper screen with the grease-spot (Fig. 2) has been adjusted until the spot has disappeared. Then the intensity of light from the standard

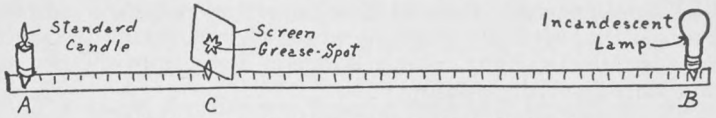

Fig. 2.—Using the Bunsen Grease-Spot Photometer

source at A, falling on the side of the screen toward A is equal to the intensity of light from the source to be measured at B falling on the side of the screen toward B. Let the position of the screen be C. It then follows from the law of inverse squares (Section 4) that

$$\frac{\text{Candle Power of Standard Source}}{\text{distance (AC)}^2} = \frac{\text{Candle Power of Unknown Source}}{\text{distance (BC)}^2}$$

The following example will help in understanding this principle. In comparing an incandescent lamp with a standard international candle the screen was adjusted so that the grease-spot disappeared when the screen was four inches from the candle and 20 inches from the incandescent lamp. Applying the above rule one finds

$$\frac{\text{One International Candle}}{4^2} = \frac{\text{x International Candles}}{20^2}$$

Solving $16x = 400$, $x = 25$. Therefore the strength or illumination intensity of the incandescent lamp is 25 International Candles.

8.—Distribution of Light. No artificial source of light gives uniform illumination in all directions. For instance the area about the base of an incandescent electric light does not receive as much illumination as the areas in other directions. Because of this the candle power of such lights is measured in several directions in a horizontal plane through the light. The average of these is known as the mean horizontal candle power and this is the candle power which is given when the illumination intensity of such a lamp is stated. The use of reflectors still further disturbs the distribution of the intensity. Thus by the use of certain reflectors the horizontal intensity may be reduced to as low as 6 candles, while the vertical intensity may be increased to 50 candles.

9.—Measurement of Intensity of Illumination. While the intensity of a source of light is measured in candle power or international candles, the illumination received on various surfaces at a distance from the source is measured in foot candles. The foot candle is defined as *the intensity of illumination on a surface at a distance of one foot from a standard candle and at right angles to the rays.* It will be observed that the

$$\text{illumination (foot candles)} = \frac{\text{candle power}}{\text{distance squared (ft.)}^2}$$

10.—Reflection of Light. When light strikes an object it may be either reflected or absorbed by it. It is by the reflected light that we see various objects. If light strikes a piece of paper or a block of wood the reflected light is scattered from the comparatively rough surface. If, however, the light should strike a highly polished metal surface the reflected light enters the eye as though it came directly from a distant source. Such reflection is called regular reflection and is the type of reflection observed each time we look into the surface of a mirror. It will be more generally realized how important reflected light is when one observes that all light entering windows not directly receiving the sun's rays is reflected light, mostly scattered light from the sky and the landscape outside of the window.

11.—Laws of Reflection of Light. The laws of reflection of light are best examined experimentally. If a small mirror is stood on edge, as shown in Fig. 3, and before it is placed a pin in position A, the image of this pin will be observed at A′. If now pin B is placed against the mirror and pin C some distance from the mirror so that C, B, and the image A′ appear to be in one straight line, the path of light from the pin A may be determined. It is shown to be A to B to C. If now from the point A a line is drawn normal, that is, at right angles to the mirror to the point D and the angles ABD and CBD are measured, it is observed.

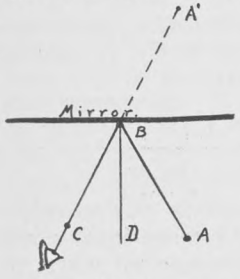

Fig. 3
Laws of Reflection of Light

I. *The incident ray* AB, *the normal* BD, and *the reflected ray* BC *all lie in one plane.*

II. *The angle of incidence* (angle ABD) *is equal to the angle of reflection* (angle CBD).

12.—Images in a Plane Mirror. Any one standing in front of a mirror sees his own image and that of objects about him as if they were behind the mirror. Fig. 4 shows the path of light rays as such an image is formed. These rays obey the laws of reflection given in the previous section. It will be observed that the line joining any point of the object to the corresponding point of the image is at right angles to the mirror and is bisected by the surface of the mirror. In general we may state *that the image formed by a plane mirror is as far behind the mirror as the object is before it: and that the line joining the image and the object forms a right angle with the surface of the mirror.*

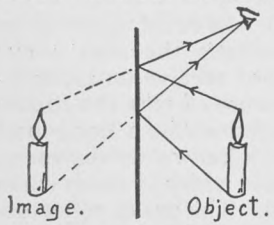

Fig. 4
Formation of an Image in a Plane Mirror

By holding a written word before the mirror and trying to read the image one observes another property of plane mirrors, namely, that images in such mirrors are laterly inverted.

13.—Laboratory Experiments in Light. It will be noted that nine out of the 25 experiments prescribed as laboratory experiments for Grade XI students are on light. Most of these experiments can be performed by the aid of simple apparatus but require that students carrying out the experiment be in a darkened room and by themselves. It is

suggested that in order to carry out these experiments successfully the apparatus should be loaned to students from school and the experiments be performed in a dark room in the evening at home. A written report of such experiments should be required from the students. A laboratory manual giving full directions for the carrying out of the listed experiments may be obtained from the Western Extension College.

14.—Tests.

1. Make a numbered list of words or phrases necessary to complete each of the following statements correctly.

(*a*) Light may be defined as (1).....

(*b*) The three theories which have been held as regards the nature of light are (2).....

(*c*) Light waves are very closely related to the shorter (3)..... and the longer (4).....

(*d*) Light travels through a supposed substance called (5)..... by means of (6)..... in straight lines called (7).....

(*e*) The formation of an image by a pinhole is proof of the fact that light (8).....

(*f*) The law of inverse squares states (9).....

(*g*) The standard used to measure the intensity of a source of light is (10).....

(*h*) The intensity of a source of light is measured in (11)..... and the intensity of illumination in (12).....

(*i*) Any instrument used to compare strength of various light sources is called a (13).....

(*j*) The amount of illumination at a distance from the source of light is found by (14).....

(*k*) A room with north windows only is lighted by (15).....

(*l*) The laws of reflection of light are (16).....

(*m*) The position of an image with regard to an object placed before a plane mirror is (17).....

2. In measuring the candle-power of an incandescent lamp it was compared with a second standard incandescent lamp of 5 international candles. The grease-spot disappeared when the screen was one foot from the standard and 5 feet from the unknown lamp. What was the power of the incandescent lamp?

3. What will be the intensity of illumination on the printed page of a book held at a distance of three feet from a 90 candle-power light source?

Answers to 1:—(1) That radiant energy which falling on the retina of the eye causes the sensation of sight. (2) Corpuscular, Wave, and Quantum. (3) X-rays. (4) Infra red or radio waves. (5) Ether. (6) Electromagnetic waves. (7) Rays. (8) Travels in straight lines. (9) The intensity of illumination varies inversely as the square of the distance from the source. (10) International Candle. (11) Candle power. (12) Foot-candles. (13) Photometer. (14) Dividing candle power by the distance squared. (15) Scattered reflected light. (16) See section 11. (17) As far behind mirror as object is in front of it, and line oining image and object is at right angles to surface of the mirror.

Examination Solutions

GRADE IX HEALTH EDUCATION, 1935 (Sask.)

1. In two or three sentences tell why each of the following is necessary for good health:
(*a*) Food must be well chewed; (*b*) We should drink plenty of water. (*c*) We should eat regularly; (*d*) We should avoid breathing dust-laden air.

Answer.

(*a*) Food must be chewed well as the acid in the gastric juice stops the action of the ptyaline and the starches will not be digested. Eating slowly gives the nervous system an opportunity to settle down and control the digestive organs properly.
(*b*) Water stimulates the flow of digestive juices and hastens digestion. It softens the food in the intestine and helps in its onward movement. It also regulates the body heat.
(*c*) The glands need time to rest and prepare enzymes. Eating between meals dulls the appetite, and a good appetite is valuable in causing an abundant flow of digestive juices.
(*d*) Dust particles are sharp and cut the linings of the respiratory tract. These leave openings through which disease germs may enter.

2. (*a*) Give two reasons why the nervous system is necessary to the body.
(*b*) Distinguish between Central Nervous System and Sympathetic Nervous System with regard to: (*i*) functions; (*ii*) the parts of which each consists.
(*c*) State four ways by which you can help to keep your nervous system in good condition.

Answer.

(*a*) (1) The nervous system controls all the body organs. (2) It connects all parts of the body and causes them to work together.
(*b*) (*i*) The Central Nervous System controls the voluntary muscles and acts as an organ of the mind. The Sympathetic Nervous System controls the involuntary muscles and the glands.
(*ii*) The Central Nervous System is made up of brain, spinal cord, and the nerves arising from them. The Sympathetic Nervous System is made up of two chains of ganglia, one on either side of the spinal column, and the nerves which arise from them.
(*c*) 1. Get plenty of sleep and rest. 2. Avoid worry. 5. Avoid harmful drugs. 4. Avoid the use of alcohol and tobacco. 5. Avoid over-work and fatigue.

3. (*a*) State three functions of the blood in the body.
(*b*) Name and state the function of each of the five circulatory organs.
(*c*) What first-aid would you render to a person who has cut an artery in his wrst?

Answer.

(*a*) 1. To carry food, water, and oxygen to the cells. 2. To carry wastes from the cells. 3. To carry heat from the warmer to the cooler parts of the body.

(*b*) 1. The heart pumps the blood through the body. 2. The arteries carry blood from the heart. 3. The veins carry blood to the heart. 4. The capillaries carry blood from the arteries to the veins. 5. The blood—see (*a*) above

(*c*) 1. Call a doctor. 2. Apply a tourniquet on the arm above the wound. (Release every 20 minutes). 3. Elevate the arm.

4. (*a*) Make a diagram of the respiratory tract. Label the following parts: trachea, nasal chamber, air sacs, bronchial tubes, larynx, pharynx.

(*b*) Write a note on the changes in air while it remains in the air sacs.

Answer.

(*a*) *Ritchie*—Figs. 82 and 83.

(*b*) Oxygen passes through the walls of the air sacs into the blood. Carbon dioxide and water pass from the blood into the air sacs.

5. (*a*) State three important points in connection with good ventilation.

(*b*) State two means by which the normal temperature of the body is maintained

(*c*) State four ways in which body wastes are eliminated.

Answer.

(*a*) 1. Air must be in motion. 2. Proper humidity. 3. Proper temperature.

(*b*) Oxidation of food in the cells supplies the heat. Evaporation of sweat on the surface of the skin cools the body.

(*c*) 1. Wastes are eliminated through the large intestine. 2. Carbon dioxide and water are given off from the lungs. 3. Water is excreted through the sweat glands. 4. Water, uric acid, and urea are excreted by the kidneys.

6. (*a*) State three uses of muscles to the body.

(*b*) Explain the action of antagonistic muscles.

Answer.

(*a*) 1. Move the body. 2. Help enclose the body cavities and protect delicate organs. 3. Help bind the skeleton together at the joints.

(*b*) Muscles cannot push, they can only pull. If a bone is pulled in one direction only, an antagonistic muscle can pull it back. It is the action of antagonistic muscles which enables us to make fine, delicate movements.

7. (*a*) State three uses of the skeleton to the body.

(*b*) Of what two materials is bone composed?

(*c*) State two reasons why good posture should be maintained during childhood.

(*d*) Name three kinds of movable joints in the body.

(*e*) State four means by which good posture can be developed.

Answer.

(*a*) 1. To support the body. 2. To protect delicate organs. 3. To act as a system of levers by which the body can be moved.

(*b*) Animal and mineral matter.

(*c*) 1. Youth and childhood is the best time to strengthen weak muscles. 2. Joints will become fitted together in a stooped position 3. Cartilage between the vertebrae will become wedge-shaped. 4. Muscles will become stretched to fit a stooped skeleton.

(*d*) 1. Hinge joint. 2. Sliding joint. 3. Ball and socket joint.

(*e*) 1. Thrust the head as high as possible. 2. Draw the abdomen in. 3. Pull the chin in. 4. Strengthen weak muscles.

8. (*a*) Tell the use of the following: periosteum, cartilage, tendon, pleurae, white corpuscles, red corpuscles.

(*b*) Tell what is meant by: afferent impulse, reflex action, renal corpuscle, habit.

Answer.

(*a*) periosteum—nourishes the outside of bones; cartilage—covers the end of bones in movable joints and makes the ribs springy; tendon—attaches a muscle to a bone; pleurae—prevents friction as the lungs expand and contract; white corpuscles—kill germs; red corpuscles—carry oxygen.

(*b*) afferent impulse—an impulse in an afferent nerve, that is, one going to the brain or cord; reflex action—an action which is caused by an impulse that starts in an afferent nerve; renal corpuscle—a double-walled sac surrounding a tuft of blood vessels in the kidney; habit—an action which has been repeated so often that it is done without thought.

GRADE X HEALTH EDUCATION, 1935 (Sask.)

1. (*a*) What is meant by "immunity from disease"? Explain the difference between "natural" and "acquired" immunity.

(*b*) Where do disease germs come from? Describe how the body kills disease germs.

(*c*) What steps would you take to prevent the spread of smallpox in your district?

Answer.

(*a*) A person has immunity when an infective agent gets into the body and there is no apparent result. Natural immunity is present by nature, while acquired immunity develops as the body recovers from a disease.

(*b*) Disease germs come from other disease germs of the same kind usually growing in a human body. The body kills disease germs by producing germicidal substances and by increasing its number of white corpuscles. These devour the germs.

(*c*) To prevent the spread of smallpox have everyone vaccinated; isolate any who may have the disease; keep the patient's bedclothes, dishes, etc., separate; have those who are caring for the sick wear gowns, which are to be left in the sick room, and wash their hands carefully before approaching anyone else.

2. (*a*) Describe, using a diagram, the structure of the eye.

(*b*) What natural protection is provided for the eyes?

(*c*) What are the important points to be remembered in the care of the eyes?

(*d*) How would you remove a foreign body from the eye?

Answer.

(*a*) *Ritchie*—Fig. 124.

(*b*) The eye is protected by: the bony eyesocket and its pad of fat which protect from blows; the eyelash and eyebrow which protect from dirt; the eyelid which closes when a blow threatens; the lachrymal fluid which washes the eye; the Meibomian glands which prevent the loss of lachrymal fluid.

(*c*) Care of the eyes: spectacles or eye-glasses should be worn when they are needed; use a good light for reading or other close work; do not read while lying down; rest the eyes occasionally; keep dust out of the eyes.

(*d*) Turn the upper lid inside out and remove the object with a wisp of cotton on a match or toothpick.

3. Write notes upon the *effects of alcohol* on the human body under the headings: (*a*) Alcohol and length of life; (*b*) relation of alcohol to insanity; (*c*) alcohol and heredity; (*d*) alcohol and character.

Answer.

(*a*) Insurance statistics show that the death rate is from 25% to 50% higher among alcohol users than among abstainers.

(*b*) Studies show that alcohol accounts for about 25% of all insanity found in asylums.

(*c*) The children of alcohol users have a much higher percentage of physical and mental defects than other children.

(*d*) Alcohol renders men less faithful, less honest, and less efficient. Employers hesitate to employ men who use alcohol.

4. (*a*) Mention the two kinds of poisoning with which you are most likely to come into contact, and briefly describe with reasons the first aid treatment you would suggest in each case.

(*b*) What would you do for a grade nine pupil who had fainted in school? Give the reasons for the steps you would take.

Answer.

(*a*) *Arsenic.*—Add tincture of iron to baking soda and give some of the resulting powder every few minutes. *Mercuric chloride*—Give milk and white of egg. *Phosphorus*—Magnesia and chalk in water and the white of egg. Do not give oil or milk. *Opium*—Strong coffee or ammonia. Keep the patient awake.

(*b*) Lay the patient on his back with his head lower than his body so that the blood will return to the brain. Put cold water on the face to stimulate the flow of blood to the head. Let the patient inhale spirits of ammonia to stimulate the heart beat. After the person regains consciousness, give him a drink of water and let him rest.

5. Give a discussion of each of the following topics: (*a*) Keeping bacteria out of wells. (Use diagrams). (*b*) Keeping milk free from germs. (*c*) Unhygienic habits common among children at school and at home.

Answer.

(*a*) *Ritchie*—Fig. 153.

Wells should be located on high places away from barns, pigpens and outhouses. Clay should be packed around and sloped away from the mouth of the well. The cover should be water-

tight so that no surface water can get into the well. Cementing the upper part of the well and laying a cement covering over the surface of the soil is also valuable.

(*b*) Milk containers should be scalded every day. Flies should be kept away from milk. Cool the milk rapidly. Have cows tested for diseases. Pasteurize the milk.

(*c*) Putting pencils and other objects into the mouth; drinking from a common cup; allowing fingers to touch face, eyes, and lips; not washing the hands before eating.

6. State clearly the changes which take place in the food during digestion in the mouth, in the stomach, and in the small intestine, indicating the various enzymes which act upon the food and the effect of each enzyme.

Answer.

In the mouth—ptyaline in the saliva changes starch to malt sugar. *In the stomach*—pepsin in the gastric juice changes proteins to peptones. Acid in the gastric juice stops the action of ptyaline and kills germs. *In the small intestine*—pancreatic juice contains amylopsin which acts on starches missed by ptyaline, trypsin which acts on proteins missed by pepsin, and steapsin which acts on fats. Bile helps digest fats and neutralizes the acid. Intestinal juice—sugars are changed by enzymes to grape sugar.

7. (*a*) Name the body wastes which are eliminated by the kidneys.

(*b*) Using a diagram, describe how these wastes are removed from the blood.

(*c*) Indicate the part played by (*i*) the skin and (*ii*) the lungs in removing body wastes.

Answer.

(*a*) The kidneys eliminate urea, uric acid, and water.

(*b*) *Ritchie*—Fig. 91 B.

The wastes pass from the tuft of blood vessels through the inner wall of the sac of the renal corpuscle. Then they go down the tubule, into the ureter, and then to the bladder.

(*c*) (*i*) The sweat glands in the skin excrete large quantities of water to cool the skin.

(*ii*) The lungs take carbon dioxide and water from the blood and eliminate them from the body.

ANSWERS TO SCIENCE TEST, GRADE IX

Completion Test, page 14

(1) Plumule, hypocotyl, cotyledons; (2) passing it through lime water; (3) milky; (4) carbon dioxide; (5) starch; (6) iodine; (7) blue; (8) transpiration; (9) obtain water from the soil; (10) sugar or starch; (11) Photosynthesis; (12) takes in oxygen, gives off carbon dioxide; (13) to form a conducting path between roots and leaves; (14) to carry on photosynthesis; (15) to carry on respiration; (16) stoma; (17) reproductive organ; (16) calyx, corolla, stamens, and pistil; (19) the placing of pollen on the stigma of the pistil of the flower; (20) the union of the pollen cell nucleus with the egg cell nucleus.

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